# Dice Probabilities For Regular Games and For Backgammon

When you are playing a game that involves rolling two dice, there are 36 possible rolls with two dice. Their probabilities are listed in the table below.

| Rolling a: | Probability | Rolling a: |
|---|---|---|
| **2** | $\frac{1}{36}$ | **12** |
| **3** | $\frac{2}{36}$ | **11** |
| **4** | $\frac{3}{36}$ | **10** |
| **5** | $\frac{4}{36}$ | **9** |
| **6** | $\frac{5}{36}$ | **8** |
| **7** | $\frac{6}{36}$ | |

If you take time to observe the patterns, then this is an easy table to carry around in your head for the rest of your life.

Let's pretend that you are playing a game of monopoly and your opponent is situated on the purple square States Avenue. You are playing with a prize pot on the Free Parking of $1 000. (I prefer to play without this, by the way because it favours luck over strategy). States Avenue is situated 7 squares away from Free Parking, so you offer your opponent $50 to share the pot 50-50 if he or she lands on it. As you can see from the table there is a $\frac{6}{36} = \frac{1}{6}$ chance of winning half of $1 000. What is your expectation?
Expectation is equal to probability of an event times its payoff, for each possible event. Well in this case, there is a $\frac{1}{6}$ chance of winning $500 and a $\frac{5}{6}$ chance of losing $50.

So the total expectation is: $\frac{1}{6} \times 500 + \frac{5}{6} \times (-50) = \$41.67$, thus it is a good move for you. By the way an offer of $100 would make the expectation equal to zero, which means that it is a "Fair" game.

# Probabilities of Dice Rolls in the Game of Backgammon

However, when you are playing backgammon, the number of ways that you can move is different. For instance, a roll of 5 and 6 to make a total of 11, means you can move one piece 5 places, and another piece 6 places, or one piece 11 places. A roll of 2 and 2, get doubled and becomes 2 – 2 – 2 – 2, which gives you a whole variety of moves: one piece could move 2, 4, 6 or 8, and one, two, or three other pieces moved the rest.

The table on the next page shows you how the probabilities work in these games.

| **Probability of Hitting a Blot** | | | |
|---|---|---|---|
| (This table takes for granted no enemy points between you and the blot.) | | | |
| **Distance Away** | **Ways to be Hit** | **Chances of Being Hit** | **Odds against Being Hit** |
| **1** | **11** | **31%** | **25 to 11** |
| **2** | **12** | **33%** | **2 to 1** |
| **3** | **14** | **39%** | **11 to 7** |
| **4** | **15** | **42%** | **7 to 5** |
| **5** | **15** | **42%** | **7 to 5** |
| **6** | **17** | **47%** | **19 to 17** |
| **7** | **6** | **17%** | **5 to 1** |
| **8** | **6** | **17%** | **5 to 1** |
| **9** | **5** | **14%** | **31 to 5** |
| **10** | **3** | **8%** | **11 to 1** |
| **11** | **2** | **6%** | **17 to 1** |
| **12** | **3** | **8%** | **11 to 1** |

So, with a normal game the probability of rolling a 7 is higher that the probability of rolling a 6. Whereas in backgammon, the probability of moving 6 places is 47% of all rolls, while moving 7 places is 17%. So, if you switch games, it is important that you take into account the rules of the games to see how the 36 possible rolls with two dice are going to be assigned.